COMMENTS AND RESPONSE

In view of the comments below, Applicants respectfully requests that the Examiner reconsider the present application including rejected claims, as amended, and withdraw the claim rejections.

Status of the Present Application

In the Office Action dated December 21, 2004, the Examiner stated that a request for continuing examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Applicants note for the record that they did not file a request for continuing examination, but rather the Examiner withdrew the finality of the Office Action dated July 21, 2004, and issued the current, non-final action.

Claim Rejections – 35 USC § 102

The Examiner has rejected claims 58 and 71 under 35 U.S.C. 102(a) as being allegedly anticipated by United States Patent No. 4,613,978 to Kurth et al ("Kurth"). Applicants respectively traverse this rejection.

Claim 58 recites an RFI extraction mechanism in a radio end of a UWB receiver, comprising: means for inverting and time-shifting a first impulse component and a second impulse response component in the radio from end, each of the first impulse response component having a first impulsive shape and the second impulse response component having a second impulsive shape; and means for adjusting a relative position of the first impulse response component and second impulse response component so as to pass a UWB signal, but substantially cancel a narrowband interfering signal. Kurth does not disclose these features.

Kurth discloses a system that uses frequency-domain excision of narrowband interference. As Kurth notes, one system of frequency-domain excision systems employs sampled-data, or discrete time, spectral analysis. In such a system, the input signal is repetitively sampled and subjected to analysis by means of a Discrete Fourier Transform (DFT). If certain Fourier coefficients are large due to narrowband signal components of the input, they may be reduced or eliminated after which the remaining information is reconverted to a time-domain format. In a variation of this method, a series of N input signal samples is multiplied by a discrete waveform which has a quadratically varying phase-versus-time equivalent to a linear frequency modulation or "chirp." The product signal is then passed through a linear sampled-data filter having an impulse response with 2N-1 samples and a complex exponential form with a quadratic phase identical to the pre-filter multiplication signal except for its sign. An appropriately selected N-sample segment of the output of the filter is then multiplied by a delayed version of the previously mentioned discrete waveform to obtain a discrete signal comprising a sequence of the Fourier coefficients. (See, e.g., Kurth, column 2, lines 6-29)

It should be noted for the sake of clarity that the delayed version of the previously mentioned discrete waveform mentioned here refers to the discrete waveform which has a quadratically varying phase-versus-time equivalent to a linear frequency modulation or "chirp." And the result of multiplying the appropriately selected N-sample segment of the output of the filter with this delayed waveform is a discrete signal comprising a sequence of the Fourier coefficients, not a broadband signal with a narrowband signal portion cancelled.

The Examiner relies upon this portion of Kurth as providing the teaching of all of the limitations of claim 58. However, none of this discloses inverting, time-shifting, or adjusting the relative position of impulse signals, as recited in claim 58. Converting a signal to the frequency

domain, processing it to reduce or eliminate a narrowband signal component, and then returning to the time domain is not the same as inverting, time-shifting, or adjusting the relative position a signal, as recited in claim 58.

In particular, passing a product signal through a linear sampled-data filter having an impulse response with 2N-1 samples and a complex exponential form with a quadratic phase identical to the pre-filter multiplication signal except for its sign does not disclose inverting, time-shifting, or adjusting the relative position of impulse signals. Likewise, multiplying an appropriately selected N-sample segment of an output of the filter by a delayed version of the previously mentioned discrete waveform to obtain a discrete signal comprising a sequence of the Fourier coefficients does not disclose inverting, time-shifting, or adjusting the relative position of impulse signals.

In each case the signal excision is performed in the frequency domain, not the time domain. This cannot be done in real time, and is more complex than simply inverting, time-shifting, or adjusting the relative position of impulse signals. And it is impermissible for the Examiner to read more into Kurth than is disclosed. In particular, it is impermissible to interpret chirp transform spectral analysis with inversion, time shifting, and position adjustment.

In fact, Kurth notes several difficulties with the chirp transform as used in such systems that relate to this important difference. For example, the filtering operation within the transform, for instance, is limited to a duty factor of less than 100%. (See, e.g., Kurth, column 2, lines 40-43.) Furthermore, coherent reconstruction of the time-domain waveform after excision is another problem. In both the discrete and analog chirp transforms, a segment of the input signal is gated to produce a finite duration signal representing the Fourier transform of the input segment. The inverse chirp transform operates in a similar fashion so as to produce a segment of the

interference-suppressed output waveform. Thus when the receiver input is present continually, it must be segmented and processed through chirp transform excision circuits in blocks, and the sequential output segments thereby produced must be combined with the proper phase relationships and without significant transients. For continuous or "real time" excision using analog chirp transforms, this problem is difficult to solve in practice. Furthermore, the problem is compounded by the necessity for complex switched filter configurations needed to produce 100% duty factor operation. (See, e.g., Kurth, from column 2, line 66, through column 3, line 17.)

Similarly, claim 71 recites an adjustable RFI extraction mechanism, comprising: means for time-shifting a first impulse response component and a second impulse response component of a UWB radio front end, the first impulse response component having a shape of a first wavelet of a UWB signal and the second impulse response component having a shape of a second wavelet of a UWB signal to be received; and means for adaptively adjusting a relative position of the first impulse response component and the second impulse response component to pass the UWB signal, but cancel a narrowband interfering signal.

Nothing in Kurth discloses time shifting signals or adaptively adjusting a relative position of impulse response components, as recited in claim 71. Adjusting the frequency and bandwidth of a signal is not the same as time-shifting or adaptively adjusting the relative position a signal. The reasons for this are analogous to those given above for claim 58.

Therefore, based on at least the reasons given above, Applicants respectfully request that the Examiner withdraw the rejection of claims 58 and 71 as being allegedly anticipated by Kurth.

Claim Rejections – 35 USC § 103

The Examiner has rejected claims 1-3, 27-31, and 59-62 under 35 U.S.C. 103(a) as being allegedly unpatentable over United States Patent No. 5,325,204 to Scarpa ("Scarpa") in view of Kurth. Applicants respectfully traverse this rejection.

Claim 1 recites that an incoming signal have a first component that has a first impulsive shape, and at least one other component delayed in time from said first component, and having a second impulsive shape, and that first and second widths of the first and second impulsive shapes, respectively, are less than a reference width of a half cycle of a highest frequency of the UWB signal. The Examiner acknowledges that Scarpa does not disclose this feature, and relies upon Kurth for this teaching. However, Kurth does not disclose this feature.

The Examiner cites impulsive components 19 and 21 disclosed in Kurth as showing this feature. Elements 19 and 21 are portions of the signal s(t), which is a spectral or frequency domain equivalent of the received signal. Nothing in Kurth discloses or suggests the widths of these impulsive components; in particular nothing discloses or suggests that they be specifically less than a reference width of a half cycle of a highest frequency of a UWB signal. And it is impermissible for the Examiner to read this teaching into Kurth.

Claims 2, 3, 27, and 28 depend variously from claim 1 and are allowable for at least the reasons given above for claim 1.

Claim 2 further recites that an amount of delay between the first component and the at least one second component is electrically adjustable. Nothing in Scarpa or Kurth, alone or in combination, discloses or suggests this feature.

The Examiner has asserted that Scarpa discloses this feature. However, this is not the case. The portions of Scarpa cited by the Examiner show that a course acquisition filter 30 and a

narrow tracking filter 32 can have their center frequencies adjusted to match the frequency of detected interference signals. But a notch filter is not the same as an impulse response circuit. And so the fact that Scarpa provides for bandwidth adjustment of notch filters provides no suggestion to adjust the amount of delay between first and second components in an impulse response of a circuit, as recited in claim 2.

Claim 3 further recites an amount of delay between the first component and the at least one second component is mechanically adjustable. Nothing in Scarpa or Kurth, alone or in combination, discloses or suggests this feature.

The Examiner has asserted that Scarpa discloses this feature. However, this is not the case. The portions of Scarpa cited by the Examiner show that the coefficient values of the acquisition and tracking filters can be implemented in a weight element and not using multipliers. However, this provides no suggestion for mechanically adjusting anything. Furthermore, as noted above, changing the bandwidth of notch filters is not the same as adjusting the amount of delay between first and second components in an impulse response of a circuit, as recited in claim 3.

Claim 29 recites a radio front end includes a network having an input terminal configured to receive an incoming signal that includes a UWB signal and the narrowband interference signal, an output terminal, and a circuit configured to have an impulse response having a first component that has a first impulsive shape, and at least one other component delayed in time from the first component, and having a second impulsive shape, wherein first and second widths of the first and second impulsive shapes, respectively, are less than a reference width of a half cycle of a highest frequency of the UWB signal. Nothing in Scarpa or Kurth, alone or in

combination, discloses or suggests these features for reasons analogous to those given above for claim 1.

Claims 30 and 31 depend variously from claim 29 and are allowable for at least the reasons given above for claim 29.

Claim 30 further recites that an amount of delay between the first component and the at least one second component is electrically adjustable. Nothing in Scarpa or Kurth, alone or in combination, discloses or suggests this feature for reasons analogous to those given above for claim 2.

Claim 31 further recites that an amount of delay between the first component and the at least one second component is mechanically adjustable. Nothing in Scarpa or Kurth, alone or in combination, discloses or suggests this feature for reasons analogous to those given above for claim 3.

Claim 59 recites an RFI extraction mechanism for passing a UWB signal while suppressing a narrowband interference signal that coincides with said UWB signal in frequency, comprising: a controller configured to controllably adjust a relative position of a first impulse response component and a second impulse response component of a radio front-end, wherein first and second widths of the first and second impulse response components, respectively, are less than a reference width of a half cycle of a highest frequency of the UWB signal. Nothing in Scarpa or Kurth, alone or in combination, discloses or suggests these features for reasons analogous to those given above for claim 1.

In addition, claim 59 recites a controller configured to controllably adjust a relative position of a first impulse response component and a second impulse response component of a radio front-end, said controller being configured to adjust an amplifier bias of an amplifier in said

radio front-end. Nothing in Scarpa or Kurth, alone or in combination, discloses or suggests these features.

The Examiner appears to assert that the recited controller is shown by some element in Fig. 1 of Kurth. But nothing in this drawing or the related text in Kurth discloses or suggests a controller that adjusts the position of impulse components, nor does it disclose or suggest a controller that adjusts an amplifier bias of an amplifier in a radio front-end.

Claims 60-62 depend variously from claim 59 and are allowable for at least the reasons given above for claim 59.

Claim 60 further recites a power sensor configured to determine a power level of said narrowband interference signal and inform said controller of said power level. Nothing in Scarpa or Kurth, alone or in combination, discloses or suggests this feature.

The Examiner asserts that this is shown by the wideband power estimation circuit 100 and the difference power estimation circuit 102. However, these circuits provide their outputs to a threshold compare circuit 124 which compares the two signals to determine if an interference signal is present within the passband of the narrow tracking filter 32. As noted above, Kurth does not disclose the controller recited in claim 59, so it cannot disclose elements that operate to provide signals to a controller.

However, even if Kurth did disclose such a controller, there is nothing in Scarpa or Kurth that would suggest that any power estimation signal be provided to a controller configured to controllably adjust a relative position of a first impulse response component and a second impulse response component of a radio front-end. The Examiner appears to assert that the signals from elements 100 and 102 are used to control the power levels in the frequency control circuits

35 and 37 of Scarpa. However there is nothing to suggest that elements 35 and 37 correspond to the controller recited in Claim 59.

Claims 61 and 62 also recite further elements responsive to the controller. Again the Examiner relies upon portions of Scarpa as showing these elements. However, nothing discloses or suggests why they would be responsive to the portions of Kurth that the Examiner asserts reads on the recited controller.

With respect to claims 60-62, the Examiner cannot use multiple elements in Scarpa and Kurth to show the same recited feature of claim 59 without any connection between them, nor any suggestion as to how they would properly correspond to each other. It is necessary for the Examiner not only to show each element recited, but to show how it would be obvious to connect the elements together, and to show all recited interconnections between the elements.

In addition, the Examiner has provided no motivation to combine the teachings of Scarpa with those of Kurth. All that is provided in the rejection after a recitation of citations to portions of Scarpa and Kurth is the blanket assertion that "it would have been obvious to one of ordinary skill in the art to modify Scarpa to incorporate [the claim language] in order to transmit a linear-frequency modulated waveform with large bandwidth for high-resolution imaging and low-start frequency for efficient propagation.

It is not sufficient to maintain a rejection, however, for the Examiner to simply identify each claimed element in cited references. Rejecting claims based solely on the Examiner finding corollaries for the claimed elements would permit the Examiner to reconstruct the claimed invention by picking references from diverse arts and using Appellant's invention as a blue print to make the combination. And such an approach is not permissible.

In order to prevent the use of hindsight based on the invention, the Examiner must show a motivation to combine the cited elements – some reason that a skilled artisan confronted with the same problems as the inventor and with no knowledge of the claimed invention would select the elements from the cited prior art references for combination in the manner claimed. But it is not sufficient for the Examiner to issue a simple invocation of skill in the art. If such a rote invocation were sufficient to supply a motivation to combine, most areas of technology would rarely experience a patentable technical advance. The requirement of a suggestion to combine stands as a critical safeguard against hindsight analysis and rote application of the legal test for obviousness.

In this case in particular, the teachings of Scarpa and Kurth are not even technologically compatible and are not readily combined. Scarpa discloses an apparatus that uses one or more recursive digital notch filter circuits to remove narrowband interference from a wideband communication signal. In contrast, Kurth discloses a circuit for "frequency-domain excision" of narrowband interference. This approach uses open-loop techniques in which the input signal is measured and processed to reduce the interference component detected by the measurement. It usually requires a spectral analysis of the input signal which reveals the interference as peaks in the broadband measured spectrum. The peaks are attenuated or removed from the overall spectrum and an inverse spectral analysis operation is performed to transform the spectrum back into a time-domain waveform.

Thus, Scarpa discloses a circuit that removes the interference in the time domain, while Kurth discloses a circuit that removes interference in the frequency domain. Since these two disclosed circuits approach the problem of interference from dramatically different angles and

operate in fundamentally different manners, it would not be obvious to modify either based on how the other operates.

Because the Examiner did not provide anything beyond a general assertion of motivation to combine, based on the Examiner's skill in the art, Applicant asserts that the Examiner engaged in hindsight analysis, improperly using Applicant's own claimed invention to provide the motivation to combine the cited references.

Based on at least the arguments above, the Applicants request the Examiner to withdraw the rejection of claims 1-3, 27-31, and 59-62 under 35 U.S.C. 103(a) as being allegedly unpatentable over Scarpa in view of Kurth.

Allowable Subject Matter

The Examiner indicated that claims 57 and 63-70 are allowed. Applicants respectfully acknowledge the allowability of these claims.

The Examiner objected to claims 4-18, 22-26, 32-44, and 72-77 as being dependent upon a rejected base claim, but indicated that they would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicants acknowledge the allowability of these claims if they were amended into independent form. However, Applicants do not wish to amend these claims at the present time, since the claims they depend from are allowable for the reasons given above.

Conclusion

Accordingly, Applicants respectfully submit that the claims, as amended, clearly and patentably distinguish over the cited references of record and as such are deemed allowable. Such

allowance is hereby earnestly and respectfully solicited at an early date. If the Examiner has any suggestions, comments, or questions, calls are welcome at the telephone number below.

Although it is not anticipated that any additional fees are due or payable, the Commissioner is hereby authorized to charge any fees that may be required to Deposit Account No. **50-1147**.

Respectfully Submitted,

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